

CLAIMS

What is claimed:

- 1 1. A method comprising:
 - 2 a. determining a current rate of satisfying a service level agreement
 - 3 constraint, wherein the service level agreement constraint is associated to
 - 4 selected ones of each incoming contact within a contact center;
 - 5 b. comparing the current rate to a target rate associated with the service level
 - 6 agreement constraint to calculate a satisfaction value;
 - 7 c. measuring a size of a queue associated with the service level agreement
 - 8 constraint; and
 - 9 d. calculating a potential value associated with the service level agreement
 - 10 constraint based on the satisfaction value, the queue size and a weighted
 - 11 priority level associated with the service level agreement constraint.
- 1 2. The method according to claim 1 wherein the contact center includes one or more
- 2 agents and one or more queues such that each service level agreement constraint is
- 3 associated to one of the queues, and each agent is associated with one or more of
- 4 the queues.
- 1 3. The method according to claim 2 wherein a skill level is associated to each agent
- 2 for each queue, a skill level is associated to each call, and a skill constraint is
- 3 associated to each queue such that each call is answered by an agent with skill
- 4 level equal to or greater than the skill level associated with the call.
- 1 4. The method according to claim 3 wherein after a predetermined time frame, if the
- 2 call is not answered by an agent, then the skill constraint associated with the call
- 3 is by-passed.
- 1 5. The method according to claim 2 further comprising:

2 e. calculating a potential value associated with one of the one or more queues
3 by summing the potential values of all service level agreement constraints
4 associated with the queue.

1 6. The method according to claim 5 further comprising:

- 2 f. signaling that an agent is available;
3 g. sorting a list of queues associated with the available agent according to the
4 potential energies of the queues;
5 h. selecting a non-empty queue with the highest potential energy from the
6 list; and
7 i. routing a first contact in the selected queue to the available agent.

1 7. The method according to claim 6 wherein the first contact is determined by which
2 contact arrived in the selected queue first.

1 8. The method according to claim 6 wherein the first contact is determined by
2 selecting a contact from the selected queue that minimizes a combination of delay
3 and a contact priority weight.

1 9. The method according to claim 5 further comprising:

- 2 f. calculating a potential value associated with one of the one or more agents
3 by summing the potential values of all queues associated with the agent.

1 10. The method according to claim 9 further comprising:

- 2 g. associating a new incoming contact to a queue;
3 h. sorting a list of agents associated to the queue according to the potential
4 energies of the agents; and
5 i. routing the contact to an available agent on the list with the lowest
6 potential energy.

1 11. The method according to claim 10 further comprising:

- 2 j. routing the contact to the queue if no agents on the list are available.

1 12. The method according to claim 10 further comprising:

- 2 j. placing the contact on hold and associating a wake-up time to the contact;
3 k. awakening the contact after the wake-up time has elapsed; and
4 l. routing the contact to an available agent with the lowest potential energy.

1 13. The method according to claim 1 wherein the satisfaction value is calculated by a
2 discontinuous functional relationship between the current rate and the target rate.

1 14. The method according to claim 13 wherein the functional relationship is defined
2 by:

3 $f(a,b) = (100 + |a-b|), \quad \text{for } a \leq b$
4 $f(a,b) = (|a-b|)/20, \quad \text{for } a > b$

5 where a is the current rate and b is the target rate plus a tuning factor.

1 15. The method according to claim 1 wherein the current rate is determined by
2 calculating the ratio of the sum of all contacts associated with the service level
3 agreement constraint that were picked-up within a given past time frame and that
4 satisfied the service level agreement constraint plus the sum of all contacts in the
5 queue associated with the service level agreement constraint that can still satisfy
6 the service level agreement constraint, and the sum of all contacts associated with
7 the service level agreement constraint that were picked-up within the given past
8 time frame plus the sum of all contacts in the queue associated with the service
9 level agreement constraint.

1 16. The method according to claim 15 wherein the potential value associated with the
2 service level agreement constraint is calculated by multiplying the weighted
3 priority level associated with the contact and the sum of the queue size divided by
4 a tuning factor plus the satisfaction value.

- 1 17. The method according to claim 1 wherein the service level agreement constraint
2 for each contact is satisfied when the agent receives the contact within a
3 predetermined pick-up time.
- 1 18. The method according to claim 1 wherein the queue size defines the number of
2 contacts within the queue that have yet to be picked-up by an agent associated
3 with the queue.
- 1 19. The method according to claim 1 wherein the contact is one of a telephone call, a
2 video call, an email, a chat message, and an instant message.
- 1 20. The method according to claim 1 wherein the service level agreement constraint
2 includes a pick-up time and the target rate.
- 1 21. A routing system for routing a contact to an available agent, the routing system
2 comprises:
3 a. one or more agents;
4 b. one or more queues, wherein each agent is associated with one or more
5 queues; and
6 c. an automatic call distributor configured to determine a current rate of
7 satisfying a service level agreement constraint, wherein the service level
8 agreement constraint is associated to selected ones of each incoming
9 contact within a contact center, compare the current rate to a target rate
10 associated with the service level agreement constraint to calculate a
11 satisfaction value, measure a size of a queue associated with the service
12 level agreement constraint, calculate a potential value associated with the
13 service level agreement constraint based on the satisfaction value, the
14 queue size and a weighted priority level associated with the service level
15 agreement constraint, calculate a potential value associated with one of the
16 one or more queues by summing the potential values of all service level
17 agreement constraints associated with the queue, sort a list of queues
18 associated with the available agent according to the potential energies of

19 the queues, select a non-empty queue with the highest potential energy
20 from the list, and route a first contact in the selected queue to the available
21 agent.

1 22. The routing system according to claim 21 wherein a skill level is associated to
2 each agent for each queue, a skill level is associated to each call, and a skill
3 constraint is associated to each queue such that each call is answered by an agent
4 with skill level equal to or greater than the skill level associated with the call.

1 23. The routing system according to claim 22 wherein after a predetermined time
2 frame, if the call is not answered by an agent, then the skill constraint associated
3 with the call is by-passed.

1 24. The routing system according to claim 21 wherein the first contact is determined
2 by which contact arrived in the selected queue first.

1 25. The routing system according to claim 21 wherein the first contact is determined
2 by selecting a contact from the selected queue that minimizes a combination of
3 delay and a contact priority weight.

1 26. The routing system according to claim 21 wherein the satisfaction value is
2 calculated by a discontinuous functional relationship between the current rate and
3 the target rate.

1 27. The routing system according to claim 26 wherein the functional relationship is
2 defined by:

3 $f(a,b) = (100 + |a-b|), \quad \text{for } a \leq b$
4 $f(a,b) = (|a-b|)/20, \quad \text{for } a > b$

5 where a is the current rate and b is the target rate plus a tuning factor.

- 1 28. The routing system according to claim 21 wherein the current rate is determined
2 by calculating the ratio of the sum of all contacts associated with the service level
3 agreement constraint that were picked-up within a given past time frame and that
4 satisfied the service level agreement constraint plus the sum of all contacts in the
5 queue associated with the service level agreement constraint that can still satisfy
6 the service level agreement constraint, and the sum of all contacts associated with
7 the service level agreement constraint that were picked-up within the given past
8 time frame plus the sum of all contacts in the queue associated with the service
9 level agreement constraint.
- 1 29. The routing system according to claim 28 wherein the potential value associated
2 with the service level agreement constraint is calculated by multiplying the
3 weighted priority level associated with the contact and the sum of the queue size
4 divided by a tuning factor plus the satisfaction value.
- 1 30. The routing system according to claim 21 wherein the contact is one of a
2 telephone call, a video call, an email, a chat message, and an instant message.
- 1 31. The routing system according to claim 21 wherein the service level agreement
2 constraint includes a pick-up time and the target rate.
- 1 32. A routing system for routing a contact within a contact center, the routing system
2 comprising:
3 a. one or more agents;
4 b. one or more queues, wherein each agent is associated with one or more
5 queues; and
6 c. an automatic call distributor configured to determine a current rate of
7 satisfying a service level agreement constraint, wherein the service level
8 agreement constraint is associated to selected ones of each incoming
9 contact within a contact center, compare the current rate to a target rate
10 associated with the service level agreement constraint to calculate a
11 satisfaction value, measure a size of a queue associated with the service

level agreement constraint, calculate a potential value associated with the service level agreement constraint based on the satisfaction value, the queue size and a weighted priority level associated with the service level agreement constraint, calculate a potential value associated with one of the one or more queues by summing the potential values of all service level agreement constraints associated with the queue, calculate a potential value associated with one of the one or more agents by summing the potential values of all queues associated with the agent, associate a new incoming contact to a queue, sort a list of agents associated to the queue according to the potential energies of the agents, and route the contact to an available agent on the list with the lowest potential energy.

33. The routing system according to claim 32 wherein the automatic call distributor is further configured to route the contact to the queue if no agents on the list are available.

34. The routing system according to claim 32 wherein the automatic call distributor is further configured to place the contact on hold and associating a wake-up time to the contact, awaken the contact after the wake-up time has elapsed, and route the contact to an available agent with the lowest potential energy.

35. The routing system according to claim 32 wherein the satisfaction value is calculated by a discontinuous functional relationship between the current rate and the target rate.

36. The routing system according to claim 35 wherein the functional relationship is defined by:

$$\begin{aligned} f(a,b) &= (100 + |a-b|), & \text{for } a \leq b \\ f(a,b) &= (|a-b|)/20, & \text{for } a > b \end{aligned}$$

where a is the current rate and b is the target rate plus a tuning factor.

1 37. The routing system according to claim 32 wherein the current rate is determined
2 by calculating the ratio of the sum of all contacts associated with the service level
3 agreement constraint that were picked-up within a given past time frame and that
4 satisfied the service level agreement constraint plus the sum of all contacts in the
5 queue associated with the service level agreement constraint that can still satisfy
6 the service level agreement constraint, and the sum of all contacts associated with
7 the service level agreement constraint that were picked-up within the given past
8 time frame plus the sum of all contacts in the queue associated with the service
9 level agreement constraint.

1 38. The routing system according to claim 37 wherein the potential value associated
2 with the service level agreement constraint is calculated by multiplying the
3 weighted priority level associated with the contact and the sum of the queue size
4 divided by a tuning factor plus the satisfaction value.

1 39. The routing system according to claim 32 wherein the contact is one of a
2 telephone call, a video call, an email, a chat message, and an instant message.

1 40. The routing system according to claim 32 wherein the service level agreement
2 constraint includes a pick-up time and the target rate.